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Determinants of intellectual capital disclosure in prospectuses of initial public offerings

Inderpal Singh and J-L. W. Mitchell Van der Zahn*

Abstract—Intellectual capital is recognised as the new economic era's pivotal factor underlying value creation. Deficient and inconsistent intellectual capital reporting is escalating information asymmetry between informed and uninformed investors. This provides fertile ground for informed investors to extract higher abnormal returns and higher wealth transfers from uninformed investors, particularly during a firm's initial public offering (IPO). This study investigates the association between intellectual capital disclosure levels in prospectuses of 444 IPOs listing on the Singapore Stock Exchange between 1997 and 2006, and three potential explanatory determinants: (1) ownership retention; (2) proprietary costs; and (3) corporate governance structure.

Statistical analysis supports our conjecture of a positive association between intellectual capital disclosure and ownership retention. We also find, consistent with expectations, a negative influence of proprietary costs on the positive intellectual capital disclosure – ownership retention association. However, contrary to predictions, we do not find an IPO's corporate governance structure significantly influences the negative interaction of proprietary costs on the ownership retention – proprietary cost association. Our findings have implications for various parties such as regulators who may impose unnecessary costs on issuers if they introduce mandatory disclosures whilst lacking an understanding of the factors influencing intellectual capital disclosures.

Keywords: intellectual capital; disclosure; determinants; Singapore; initial public offerings

1. Introduction

Business dynamics of the 21st century are increasingly determined and driven by intellectual capital/knowledge-based elements. Numerous corporate executives, practitioners and business professionals, policymakers and scholars alike acknowledge factors of production, products and services, and market place dynamics will be radically different than previously. The coming century will by necessity be an integrated and technologically networked global economy, recasting comparative advantages and discriminating pricing for goods and services. In the future business and economic landscape, raw materials and their processing will decline in value whilst that of intellectual capital resources will increase. This clearly calls for a refreshed – if not alternative – understanding of business principles, information reporting and decision-making processes.

Market participants, practitioners and regulators alike argue there is an important need for greater investigation and understanding of intellectual capital disclosure as the usefulness of financial information in explaining firm profitability continues to deteriorate (Lev and Zarowin, 1999). Bukh (2003), for example, asserts that traditional reporting mechanisms are not able to cope adequately with the reporting requirements of new economy firms. Bozzolan et al. (2003), meanwhile, observe an increasing dissatisfaction with traditional financial reporting and its ability to convey to investors the wealth creation potential of firms.

Despite growing interest and demand for intellectual capital information, prior research (e.g. Williams, 2001; Beaulieu, et al., 2002; Garcia-Meca et al., 2005) suggests a persistent and significant variation in the quantity and quality of information reported by firms on this pivotal resource. As existing economic and business metrics track a declining proportion of the real economy, the deficiency and inconsistency in the reporting of intellectual capital-related information is creat-

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ing growing information asymmetry between informed and uninformed investors (Eustace, 2000; Gröjer, 2001; Walker, 2006). This provides fertile ground for informed investors to extract higher abnormal returns.

Opportunities for informed investors to extract higher wealth transfers from uninformed investors are particularly ripe when information asymmetry is naturally high such as a firm's initial public offering (IPO). Liberalisation of financial capital movement, in conjunction with financial market integration, provided an enriched sustainable environment during the past decade for the intensive expansion of numerous capital markets worldwide. A growing proportion of IPOs listing during this period – and with numbers projected to increase in the future – are intellectual capital intensive firms. Greater listing of firms particularly prone to information asymmetry concerns provides an additional incentive to understanding intellectual capital disclosure practices of IPOs.

Despite the increasingly significant role to today's firms, and intensive information asymmetry concerns (particularly within an IPO setting), very few studies have addressed the issue of intellectual disclosure practices by listing firms. Our study addresses this important void in the accounting, finance and intellectual capital literatures. Drawing on signalling theory, we identify and examine three potential determinants that may promote or constrain voluntary intellectual capital disclosure in IPO prospectuses. The three specific determinants investigated are: (1) ownership retention; (2) proprietary costs; and (3) corporate governance structure.

Past IPO literature suggests ownership retention (Leland and Pyle, 1977) is a signal of firm quality. We extend this notion postulating ownership retention is a complementary signal to intellectual capital disclosure. Verrecchia (1983) suggests firms faced with high proprietary costs are likely to limit voluntary disclosure. Based on this contention, it is our conjecture the intellectual capital disclosure–ownership retention association will be suppressed by the extent of proprietary costs faced by an IPO. Previous researchers suggest corporate governance structure can reduce a firm's cost of capital (e.g. Certo et al., 2001). Consequently, our final conjecture is that stronger corporate governance structures mitigate negative influences of higher proprietary costs on the association between intellectual capital disclosure levels and ownership retention.

Singapore is a vibrant environment for investigating issues related to intellectual capital and IPOs. First, with a very small land mass, Singapore's rapid economic growth is primarily driven by development of key intellectual capital resources. Second, Singapore is ranked one of the world's most business-friendly economies (World Bank, 2007). Also, Singapore has a well-established corporate law and governance system (Political and Economic Risk Consultancy (PERC), 2006; The Fraster Institute, 2007).[1] Similarities with regulatory practices in major capital markets will enable results from our study to be generalised more broadly. For example, the corporate regulatory system in Singapore was adapted from the British and still bears close resemblance today. Also, the legal and governance framework is highly aligned with the Commonwealth model such that Singapore is recognised as a corporate governance leader in Asia (Mak and Chng, 2000).[2] Accounting standards in Singapore have long been highly consistent with IAS/IFRS requirements with accounting practices regulated by professional institutions (e.g. Institute of Certified Public Accountant of Singapore (ICPAS); Stock Exchange of Singapore (SGX)) and government bodies (e.g. Accounting Standards Council (ASC)) (ACGA, 2007). The auditing market in Singapore is dominated by Big Four accounting firms (Rusmin et al., 2006) whilst there are sophisticated intermediaries such as security analysts, credit rating agencies and investors acting as market monitors (Mak and Chng, 2000). Finally, Singapore's capital and IPO markets are mature, highly active and internationalised.[3] Comprising two primary boards (SGX Main Board and SGX SESDAQ)[4] the SGX has grown significantly since the late-1990s with the number of firms listed by the end of 2006 having more than doubled (nearly three times) since the start of 1997 (SGX Factbook, 2006).

Statistical analysis is based on a sample of 444 IPOs listing on the Singapore Stock Exchange (SGX)[5] between 1 January 1997 and 31 December

[1] Singapore's corporate governance system is perceived to be the highest in Asia whilst the legal system is also ranked number one in Asia for integrity and lack of corruption (La Porta et al., 1997, 1998; PERC, 2006).

[2] Relative to other Asian nations (and many worldwide) Singapore has been a leader in developing corporate governance practices. For example, since 1990 publicly listed firms in Singapore have been required to have established audit committees. In contrast, audit committees were not formally required in other Asian (and many developed economies like Australia) nations until the late 1990s.

[3] As of 31 December 2006, more than 20% of firms listed on the SGX were domiciled overseas (SGX Factbook, 2006).

[4] Firms wishing to list on the SGX Main Board are subject to higher initial pre-listing performance standards than counterparts listing on the SGX SESDAQ. In essence, the SGX SESDAQ was established to allow younger firms without a lengthier, positive financial performance history access to capital market funding.

[5] The highly internationalised SGX is a pivotal capital market in Asia with listed firms having more than doubled since 1997. We focus on Singapore because the nation's lack of natural resources meaning profitability of Singapore firms is highly dependent upon the development and maintenance of intellectual capital resources. Consequently, intellectual capital disclosure is important to Singapore firms and market participants in enabling better valuations.

2006. We find average intellectual capital disclosure levels in IPO prospectuses increased annually between 1997 and 2006. Statistical tests indicate a significant positive association between intellectual capital disclosure and ownership retention. Additionally, we find a negative influence of proprietary costs on the positive intellectual capital disclosure–ownership retention linkage. Contrary to expectations we do not find better corporate governance structures influence the ownership retention–proprietary cost–intellectual capital disclosure interaction. Our findings have implications for various parties. For example, regulators may impose unnecessary costs on issuers if mandatory reporting is introduced without sufficient understanding of factors influencing intellectual capital disclosure.

Our study contributes to various literatures (i.e. accounting, finance and intellectual capital) in two key aspects. First, our study considers potential determinants of intellectual capital disclosure most befitting of an IPO setting. Previous related work (e.g. Bukh et al., 2005a) generally concentrates on traditionally established disclosure determinants such as firm size, leverage or firm performance. Findings from our study help build an expanded profile of factors influencing intellectual capital disclosure. Second, we draw on the tenets of an established theoretical perspective to consider the underlying rationale motivating disclosure of intellectual capital-related information. This is contrary to prior intellectual capital disclosure determinant research that usually lacks an underlying theoretical foundation to explain why factors selected influence intellectual capital disclosure practices. Application in our study of a specific theoretical perspective can provide a foundation for more constructive theorisation of intellectual capital disclosure practices in the future. Aside from the two major contributions noted we provide other important offerings. For example, our in-depth longitudinal study provides further evidence of growth in quantity of intellectual capital information disclosed during the past two decades. Furthermore, we report about intellectual capital disclosure practices for firms from a nation reliant on intellectual capital not previously examined; thereby, adding an additional piece to the global jigsaw map on intellectual capital disclosure practices. Finally, whilst offering its own individuality Singapore's regulatory and institutional environment overlaps with regulations and requirements observed in major international capital markets. This assists, therefore, in generalising findings from our study to other nations and regions.

The remainder of this paper is organised as follows. The next section outlines the extant literature associated with voluntary disclosure and information asymmetry. This is followed in Section 3 with the formal development of testable hypotheses. The research method is discussed in Section 4 with sample selection, descriptive and statistical results reported in Section 5. Discussion and conclusions are drawn in Section 6.

2. Literature review: voluntary disclosure and information asymmetry

Prior research implies intellectual capital resource-rich firms exhibit more volatile market values and are subject to a higher degree of information asymmetry. Aboody and Lev (2000), for example, report that intangibles (an intellectual capital component) contribute positively to information asymmetry particularly amongst research and development (R&D) intensive firms. Consequently, informed investors achieve abnormal returns (Aboody and Lev, 2000). Amihud and Mendelson (1986) and Lev (2001) also attribute widening bid-ask spreads to information asymmetry. To compensate, investors require higher returns thus driving up the cost of capital.

With respect to intellectual capital Van der Meer-Kooistra and Zijlstra (2001) report that a lack of disclosure related to this pivotal resource increases investors' risk perception. They (Van der Meer-Kooistra and Zijlstra, 2001: 457) argue 'a lack of information about investments in intellectual capital could lead to an underestimation of future earnings' and, thereby, increases the cost of capital. Chan et al. (2001) provide similar findings regarding R&D arguing that lack of disclosure increases the degree of uncertainty (or perceived risk) for R&D intensive firms. Consequently, return volatility intensifies with greater R&D expenditures that are supported by low disclosures. Again, higher cost of capital results. Chan et al., 2001: 2454 argue 'even if market prices on average incorporate the future benefits from R&D, the lack of accounting information on such an important intangible asset may impose real costs on investors through increased volatility.'

To reduce investors' perceived risk and firm value volatility, various studies (e.g. Diamond and Verrecchia, 1991; Elliot and Jacobson, 1994; Coles et al., 1995; Botosan, 1997, 2006; Sengupta, 1998) suggest greater disclosure decreases the required return by investors. Diamond and Verrecchia (1991) and Zhang (2001) develop theoretical models demonstrating the relations between voluntary disclosure and a firm's cost of capital. Diamond and Verrecchia (1991) conclude increased voluntary disclosure results in a reduction in the information asymmetry component of the cost of capital. Information asymmetry arises as a result of the market participants having different levels of information. Zhang (2001), meanwhile, posits private information production by investors leads to a widening information gap between informed

and uninformed investors, resulting in increased cost of capital. Firms can reduce this information asymmetry and, thereby, lower their cost of capital by increasing the level of voluntary disclosure.

Consistent with these views, Lev (1992) also asserts that the existence of a permanent information gap between outsiders and insiders creates the need for a systematic disclosure strategy by firms. Similarly, Leuz and Verrecchia (2000) explored the notion that a firm's commitment to greater disclosure should lower the information asymmetry component of the firm's cost of capital. Leuz and Verrecchia (2000) contend that to overcome the reluctance of potential investors to hold firm shares in illiquid markets, firms must issue capital at a discount leading to fewer proceeds to the firm and, thus, higher cost of capital. Empirical results from Botosan (2000) support this view. Botosan (2000) found the cost of equity capital decreased with increases in the level of two categories of information: forward looking information (forecasts of sales, profits and capital expenditure) and key non-financial statistics (order backlogs, market share and growth in units sold). An important implication of Botosan (2000), therefore, is there is room for improvement in the voluntary disclosure by all firms, especially in the forward looking and non-financial categories.

Healy and Palepu (1993) argue corporate managers issuing equity (or acquiring another company) would consider it important for investors to have a favourable perception of the issuer (or acquirer). Myers and Majluf (1984) point out that entrepreneurs seeking external financing have incentives to make voluntary disclosure to mitigate information asymmetry problems. Empirical evidence of analysts' ratings of disclosure supports the view that firms issuing securities provide greater disclosures (Lang and Lundholm, 1993). In later work, Lang and Lundholm (1997) document a significant increase in disclosure beginning six months prior to the issue of equity, particularly for items over which management has greater discretion. Healy and Palepu (1993) also suggest managers can improve investor communication by developing disclosure strategies that help investors understand managers' business objectives. Voluntary disclosures could include articulation of the firm's long-term strategy, specification of non-financial leading indicators useful in judging the effectiveness of the strategy implementation, discussion of the leading indicators and outlines of present and future joint ventures, strategic alliances and partnerships.[6]

In the IPO context Leland and Pyle (1977) establish a simple model of capital structure and financial equilibrium in which entrepreneurs seek financing of projects whose true characteristics are known only to them. Allen and Faulhaber (1989) assert that an important issue in signalling models is whether the signal being examined would be used if the firm had a wider choice of available signals. IPOs can signal their quality with several variables other than price such as underwriter choice (Booth and Smith, 1986) and auditor (Titman and Trueman, 1986). Allen and Faulhaber (1989) argue price is likely to be just one of several signals used to convey information. Ownership retention is frequently cited as a prime signal of an IPO's quality (Jog and McConomy, 2003). Gonedes (1978), for example, argues IPO managers will use their ownership retention as a signal to complement voluntary disclosures (such as that related to intellectual capital) made in the prospectus. By retaining a higher ownership percentage post-listing, pre-IPO owners signal to investors the firm's quality by accepting greater risk rather that diversifying their interests by retaining less interest in a single entity.

Whilst there appears a general consensus that voluntary disclosure benefits firms accessing capital markets, there are disincentives for managers to make full disclosure. This is because such disclosure would contain proprietary information that would undermine the firm's competitive position (Dye, 1986; Verrecchia, 1983). Empirical studies of the impact of proprietary costs suggest disclosure is hampered by proprietary costs. Scott (1994) carried out an empirical investigation of the proprietary cost implications of defined benefit pension plan (DBPP) disclosures in Canada. He (Scott, 1994) found a significant negative association between the probability of a firm disclosing pension plan information and the potential proprietary costs attached to its labour relations. The larger the proprietary cost, the greater the decrease in firm value, and the greater the incentive not to disclose. Guo et al. (2004) examine the impact of various competitive costs on the extent of product-related information disclosed by biotech IPOs in prospectuses. They (Guo et al., 2004) find biotech firms operate in a highly competitive environment and, therefore, are reluctant to disclose product-related information with high proprietary costs.

An entity's corporate governance structure may mitigate the disincentive to voluntarily disclose key information with high proprietary costs. Stronger corporate governance mechanisms are thought to lower the cost of equity by reducing the cost of external monitoring by outside investors. Lombardo and Pagano (2002), for example, postulate that investors need to incur external monitoring costs to ensure a given pay-off from

[6] Disclosure on issues such as present and future joint ventures, strategic alliance and partnerships or a firm's long-term strategy are representative of disclosures that would fall within the scope of intellectual capital.

management. Additional monitoring costs are compensated by a higher required rate of return. External investors are likely to demand a lower required rate of return from firms with better corporate governance. This is because they can spend less time and resources on monitoring the management. Corporate governance can also reduce the cost of equity by limiting opportunistic insider trading, thereby, reducing information asymmetry. Battacharya and Daouk (2002), for example, find the cost of equity in a country decreases significantly after the first prosecution under insider trading laws. If corporate governance mechanisms reduce the cost of capital then this provides greater scope for firms to voluntarily disclose more information even in light of high proprietary costs. Recent evidence from the UK suggests that stronger corporate governance structures are associated with increased intellectual capital disclosure (Li et al., 2008).

3. Hypothesis development

The bulk of early empirical studies examined intellectual capital disclosure in the context of annual reports (Guthrie and Petty, 2000; Brennan, 2001; Beaulieu et al., 2002) with some more recent work undertaking comparative analysis across international boundaries (Bozzolan et al., 2006; Vergauwen and van Alem, 2005). Only a few studies have considered intellectual capital disclosure in IPO prospectuses (Guo et al., 2004; Bukh et al., 2005a). Bukh (2003: 51–52) states 'the prospectus indicates which type of information is selected by a company and its advisers for the best possible visualisation of the company's value creation potential in relation to investors and analysts because the prospectus intends to prove continued growth and increased shareholder wealth'. Bukh (2003) concludes that the inclusion of information on intellectual capital in prospectuses is an indication that companies and their advisers believe this type of information is important in the capital market's assessment of the value of the company.

Consistent with prior research (e.g. Diamond and Verrecchia, 1991; Botosan, 1997, 2006; Sengupta, 1998) it is our general contention that voluntary disclosure of intellectual capital information will reduce a firm's cost of capital. As per Section 2 discussion, we contend that within an IPO setting, the extent of intellectual capital disclosure depends upon signalling mechanisms, proprietary costs and the firm's corporate governance structure. Specifically, we propose since intellectual capital disclosures are not as easily interpreted by investors (given the lack of a recognised reporting framework), management must incur costly signals such as higher fractional ownership post-listing to complement direct disclosure signals (Hughes, 1986). Firms entering highly competitive industries, however, may elect to restrict voluntary disclosures (Darrough and Stoughton, 1990), particularly those associated with intellectual capital (Guo et al., 2004), even with high levels of ownership retention. Finally, strong corporate governance structures may override high proprietary costs negative influence associated with disclosure (such as intellectual capital information) leading to increased reporting (La Porta et al., 1997; 1998).

Formal hypotheses to test our general conjecture of ownership retention, proprietary costs and corporate governance structure influences are developed in the following sub-sections.

3.1. Ownership retention

Certo et al. (2001) argue two central tenets of signalling theory are: (1) a signal must be observable and known prior to the IPO; and (2) the signal must be more costly for lower quality IPO firms to mimic. We take the perspective that the proportion of shares retained by the original owners is a signal observable in the prospectus document and one lower quality firms find costly to imitate. Specifically, owners of low quality firms would want to diversify as much personal risk as possible by attempting to sell as many of their IPO shares as possible (Downes and Heinkel, 1982).

Leland and Pyle (1977) developed an equilibrium signalling model which predicts the behaviour of the entrepreneur faced with information asymmetry. In Leland and Pyle's (1977) model, it is implied that the entrepreneur's willingness to invest in his own project signals to the market that the project is of good quality. It is costly for the entrepreneur to retain a significant ownership stake in the firm as this action would preclude the entrepreneur from diversifying his personal investment portfolio. Therefore, the entrepreneur will only retain a significant ownership interest if expected future cash flows are higher relative to the current firm value (Leland and Pyle, 1977). Rational investors observe fractional ownership retained as a signal of firm value.

Firth and Liau-Tan (1998) argue that entrepreneurs disclose information that signals their private knowledge of the firm in order to add credibility to the basic valuation parameters contained in the prospectus (information on assets, historical profitability, economic prospects, investment plans, etc.). Firth and Liau-Tan (1998) also found that fractional ownership of the firm by the original pre-issue shareholders is a major signalling mechanism. Their (Firth and Liau-Tan, 1998) findings indicate the level of ownership retained by pre-IPO owners is used as a complementary signal. Research on intellectual capital disclosure determinants is scarce. Similarly, research on intellectual capital underpinned by sig-

nalling theory is virtually non-existent. Bukh et al. (2005a) is one exception reporting that the extent of managerial ownership prior to the IPO is significantly associated with the level of intellectual capital disclosure. Firms where management had an ownership interest upon listing disclosed more intellectual capital information (Bukh et al., 2005a).

Overall, the IPO literature implies ownership retention is a key signal to the market of a firm's quality. A good quality IPO, however, is likely to use multiple signals such as greater voluntary disclosure to entice investors to view it favourably (Jog and McConomy, 2003). Based on this premise, good quality IPOs (proxied by higher levels of ownership retention) and specifically their directors are more likely to provide greater disclosure to substantiate the value of the IPO. Therefore the following hypothesis is proposed:

H1 There is a positive association between the extent of intellectual capital disclosure and the level of ownership retention at the IPO.

3.2. Proprietary costs

Proprietary information is 'information whose disclosure reduces the present value of cash flows of the firm endowed with the information' (Dye 1986: 331). For this study, proprietary costs are viewed as a moderating variable given the highly proprietary nature of intellectual capital disclosure. That is, the impact of ownership retention on the level of intellectual capital disclosure will be moderated (negative direction) by the existence of proprietary costs for the IPO firm.

Theoretical models developed by Verrecchia (1983) suggest the threshold level of disclosure increases as the proprietary costs increase. Verrecchia (1983) suggests the nature of competition is pertinent in determining the level of disclosure. For example, product market competition may provide disincentives for voluntary disclosure (Guo et al., 2004). Further, Darrough and Stoughton (1990) assert that while voluntary information aids the capital market in evaluating the firm's value more accurately, such disclosure could compromise the firm's competitive position by revealing strategic information to potential competitors.

Beaulieu et al. (2002) find a positive relationship between the size of Swedish publicly listed firms and the total amount of intellectual capital provided in their respective annual reports. It is speculated that the lack of disclosure amongst smaller firms on intellectual capital matters could be due to threats of competitive disadvantage (Beaulieu et al., 2002). Williams (2001), meanwhile, finds that when intellectual capital performance[7] is too high, disclosure is reduced. The negative association supports the notion that firms reduce intellectual capital disclosures when performance reaches key threshold levels for fear of eroding competitive advantages (Williams, 2001). A recent study of biotech IPOs by Guo et al. (2004) investigates the impact of several competitive cost proxies on the extent of product-related information disclosed. Results indicate disclosure levels are significantly higher for firms with patent protection for their products compared to firms with no patent protection. Similar results are yielded for the other variables such as product development stage and venture capital backing (Guo et al., 2004).

Given the proprietary nature of intellectual capital information and the implications of prior studies, it is expected that firms with higher proprietary costs will result in a weakening of the positive association between ownership retention and the level of intellectual capital disclosure. This leads to the second hypothesis:

H2 The positive association between the extent of intellectual capital disclosure and the level of ownership retention will be weaker for firms with higher levels of proprietary costs.

3.3. Corporate governance structure

Prominent work by La Porta et al. (1997, 1998) highlights the potential association between corporate governance and disclosure patterns. Recent studies suggest board independence is a specific feature of corporate governance that affects corporate disclosures. Using data from Singapore, Eng and Mak (2003) hypothesised a positive association between the proportion of outside directors and the level of voluntary disclosure. Chen and Jaggi (2000) find comprehensive disclosures are positively related to the proportion of independent non-executive directors on corporate boards. Li et al. (2008) find a positive association between the proportion of independent directors and intellectual capital disclosure in the UK. These results suggest external directors play a complementary role to disclosure.

Gompers (1995) argues that in the presence of information asymmetry which is prevalent for start-up firms, an independent board structure is essential for effective monitoring. As a minimum the independent board may signal the presence of an effective monitoring mechanism, thereby, enhancing firm value (Certo et al., 2001). Fama and Jensen (1983) posit a board comprised mainly of outside directors may promote the implementation

[7] Intellectual capital performance is the increase or decline across a period of time in a firm's (a) wealth, (b) efficient output of physical assets; (c) competitive advantage; and (d) value of other types of capital that results from the activities and actions undertaken by corporate management to efficiently utilise, manage and develop the firm's intellectual capital resources (Williams, 2001).

of effective controls over reporting. Gul and Leung (2004), meanwhile, examined the linkages between board leadership structure in terms of CEO duality (CEO who jointly serves as board chair), the proportion of expert outside directors on the board and voluntary corporate disclosures. They (Gul and Leung, 2004) find CEO duality is associated with lower levels of voluntary corporate disclosures. However, the negative CEO duality/voluntary disclosure association is weaker for firms with a higher proportion of expert outside directors on the board.

Based on the above discussion this study postulates that sound corporate governance features (such as board independence) negate the weakening effects of proprietary costs on the level of intellectual capital disclosure in IPO prospectuses. This leads to the third and final hypothesis:

H3 The interaction effect of proprietary costs on the association between the extent of the intellectual capital disclosure and ownership retention will be weaker for firms with a stronger corporate governance structure.

4. Research method

This section outlines the proxy measures for the dependent, independent and control variables, and defines the main statistical model used to test the hypotheses.

4.1. Dependent variable metric

Prior research examining disclosure typically rely on either a: (1) researcher constructed disclosure index (e.g. Botosan, 1997; Guo et al., 2004); or (2) publicly available disclosure quality indicator (e.g. Lang and Lundholm, 1993, 1997; Sengupta, 1998). No public intellectual capital disclosure indicator is presently available; thus, we construct our own index. Initial selection of intellectual capital disclosure items is based on three prior indices (Williams, 2001; Beaulieu et al., 2002; Bukh et al., 2005a) previously used to measure intellectual capital disclosure in either annual reports or IPO prospectuses (Bukh et al., 2005a). All three indices were reviewed to determine overlapping items. A composite disclosure index comprising 89 items is formed. A further eight items (not contained in any of the three noted indices) is added after further consideration of the Singapore business environment and recent developments in intellectual capital research and practice. All 97 items are then comprehensively scrutinised for relevance and suitability to the study's objectives. Scrutiny involved discussions between the researchers, intellectual capital scholars and practitioners, corporate executives and accounting practitioners. From this extensive review 16 items were excluded. This left a final disclosure index comprising 81 items covering six major categories: (1) human resources; (2) customers; (3) information technology; (4) processes; (5) R&D; and (6) strategic statements. The full index is presented in Appendix A.

To minimise scoring subjectivity we use an unweighted[8] dichotomous scale (one (1) if item disclosed, otherwise zero (0)) to score each item.[9] An IPO's intellectual capital disclosure ($ICDisc_j$) level is defined as the ratio of items disclosed in the prospectus of IPO *j* to the total number disclosure items applicable to IPO *j*. The ratio, as a percentage, is arithmetically defined as:

$$\frac{\sum_{ij} DItem_i}{\sum_{ij} ADItem_i}$$

Where:

$DItem_i$ = IC disclosure index item disclosed by IPO_j in its prospectus;

$ADItem_i$ = IC disclosure index item applicable to IPO_j;

i = IC disclosure index item; and

j = IPO firm.

4.2. Independent and moderating variables metrics

4.2.1. Ownership retention

Consistent with the IPO literature we define ownership retention (denoted α_j) as the percentage of outstanding common shares retained by *pre*-IPO shareholders to total shares outstanding after the IPO (e.g. Clarkson et al., 1992; Firth and Liau-Tan, 1998). For purposes of the regression analysis a transformation based on the natural logarithm

[8] An unweighted or weighted scoring approach can be used for scoring. Prior research (Cooke, 1989; Marston and Shrives, 1991; Ho and Williams, 2003) reports either approach typically yields similar results.

[9] Various steps were taken to ensure consistency in scoring of intellectual capital disclosure in each prospectus examined. For example, before commencing scoring of all the prospectuses a random sample of 20 were scored by each author. Scores were then compared and any discrepancies noted. The authors then discussed any major discrepancies to resolve any noted differences in scoring. The review of coding and discussion of discrepancies was concluded again once all prospectuses had been coded by both authors. An additional check for consistent scoring by the authors involved the use of several independent coders throughout the coding process. That is, an independent coder was given a randomly selected sample of prospectuses (completed by the authors) for coding. Results of the coding by the independent coder were then compared to the two authors for any major discrepancies. Results of coding by the independent coders did not yield any major differences with results developed by the two authors. Independent coders included accounting professionals, investors familiar with IPO prospectuses and academic scholars.

of α_j is performed. The transformation defined by the equation $\alpha_j + \text{Ln}(1 - \alpha_j)$ is based on the approach of Downes and Heinkel (1982) and consistent with the technique as used by and defined by Jog and McConomy (2003). The transformation is performed to reduce any anomalies in the distribution of ownership retention. The post-transformation proxy values are denoted as $EDOR_j$.

4.2.2. Proprietary costs

Competitiveness in a given industry has been applied as a proxy for the proprietary costs faced by a firm in prior literature (e.g. Verrecchia, 1983; Berger and Hann, 2007).[10] Consistent with this literature we use a Herfindahl Index as the proxy measure for proprietary costs as defined by the following technique:

$$HerfIndCon_j = \sum_{j=1}^{N}\left[MarketShare_j\right]^2 = \sum_{j=1}^{N}\left[\frac{Sales_j}{\sum_{kl}^{N} Sales_{kl}}\right]^2$$

Where:

$HerfIndCon_j$ = measure of the industry concentration of the industry$_l$ to which firm$_j$ is entering.

$MarketShare_j$ = Market share of firm$_j$ within industry$_l$ to which it is entering.

$Sales_j$ = Sales of firm$_j$ for year immediately prior to its IPO as reported in the IPO prospectus.

$Sales_{kl}$ = Sales as reported in the annual report of firm$_k$ in industry$_l$ for year immediately prior to the IPO of firm$_j$ entering industry$_l$.

N = number of firms in industry$_l$.

4.2.3. Corporate governance structure

For this study, a composite measure of corporate governance (defined as $CGScore_j$) is developed such that IPO_j is given a score of one (1) (otherwise zero (0)) for each of the following conditions in the corporate governance structure met at the time of listing: (a) number of independent directors on the board of directors at time of IPO exceeds the mandatory minimum; (b) the same individual does not occupy the roles of chairman of the board and chief executive officer; and (c) the chairman of the board of directors is a non-executive director independent of management. The $CGScore_j$ value for IPO_j, therefore, ranges from 0–3.

4.3. Control variables

To formally test if intellectual capital disclosures assist investors in determining the value of an IPO beyond typical and complementary disclosures, and other signalling methods available to issuers we include a number of control variables into the analysis. Firth and Liau-Tan (1998) report a significant association between underpricing and an issuer's selection of an auditor. A higher quality IPO signals key information to market participants about the IPO's value by engaging an auditor with high reputation capital (Firth and Liau-Tan, 1998). Chen and Mohan (2002) put forward a similar argument for underwriter prestige. To control for the possible compounding signalling effects of auditor reputation we include a control variable denoted Aud_j. Following prior research (e.g. Firth and Liau-Tan, 1998; Jog and McConomy, 2003) IPO j is scored one (1) if engaging a Big Four[11] audit firm at the time of listing; otherwise IPO j is scored zero (0).

We also control for underwriter prestige consistent with past IPO research (e.g. Chen and Mohan, 2002). Without any defined ranking of underwriters in Singapore and some data availability issues we are not able to measure underwriter prestige using many of the techniques applied using data from the US. Nonetheless, we use a modified approach of Johnson and Miller (1988) and Megginson and Weiss (1991). Specifically, the prestige ($Pre_{k,i}$) of underwriter k in year i is measured as the ratio of the number of IPOs underwrit-

[10] Several approaches have been applied in the literature to measure proprietary costs. Whilst the main results reported in this study focus on industry competitiveness (as measured by the Herfindahl Index) we did consider alternative proxies for proprietary costs. For example, we also used (a) the level of research and development and (b) the number of copyrights and patents. Tests using the alternative measures yield results consistent with those using the Herfindahl Index though it is noted the significance of the association between proprietary costs and level of intellectual capital disclosure is slightly stronger for the alternative measures. However, due to concerns with consistency of data to measure the amount of R&D, and the number of copyrights and patents the authors elected to use (and report main finding) the more conservative Herfindahl Index due to greater confidence in the consistency of the data used in the measure.

[11] The term Big Four is not entirely applicable across the full observation period. In 1997 and 1998 it was widely recognised that the audit market worldwide was dominated by six major audit firms (dubbed the Big Six). At the start of 1999 two of the Big Six (Coopers and Lybrand and Price Waterhouse) had merged to form PriceWaterhouseCoopers (or PWC). For IPOs listing in 1997 and 1998 that engaged one of the Big Six firms as the external auditor were scored one (1); otherwise zero (0). In 2002 the Big Five became the Big Four after the demise of Arthur Andersen. Thus, for our study IPOs listing in 1999 to 2001 are scored one (1) if the IPO j engages an audit firm comprising the Big Five; otherwise IPO j is scored zero (0). From 2002 onwards the Big Four classification is used such that if the IPO j engages an audit firm comprising the Big Five; otherwise IPO j is scored zero (0). Whilst the term Big Four is not applicable for the entire period we solely use the phrase Big Four in the main text to avoid confusion.

ten by underwriter k in year i to the total number of IPOs in year i. Underwriters with higher Pre_k ratios in year i have higher levels of prestige capital at stake in year i relative to other underwriters and will seek to reduce underpricing (Jog and McConomy, 2003). For the control variable Und_j a score of one (1) is assigned to IPO j listing in year i if the underwriter k used by IPO j is one of two underwriters with the highest Pre_k ratios in year i. All other IPOs are scored zero (0).

Prior research indicates litigation risk may influence underpricing (Hughes and Thakor, 1992; Keloharju, 1993). Whilst litigation risk in Singapore is low, legal issues related to an IPO remain highly complex. To signal to the market information about the IPO's commitment to avoiding legal disruptions (during and after listing), promoters of a high quality IPO may be inclined to engage solicitors that are highly conversant in the IPO process. For their part, solicitors routinely dealing in IPO matters have an incentive to deal predominantly with high quality firms to protect their reputation capital as leading legal advisors on IPO issues. There is no definitive method to measure solicitor reputation. Hence, for this study we apply the approach as for underwriter prestige in following Johnson and Miller (1988) and Megginson and Weiss (1991). That is, the reputation ($Rep_{k,i}$) of solicitor firm k in year i is measured as the ratio of the number of IPOs undertaken by solicitor firm k as the lead solicitor firm in year i to the total number of IPOs in year i. Solicitor firms with higher Rep_k ratios in year i will have higher levels of reputation capital at stake in year i and will seek to reduce underpricing. For the control variable Sol_j a score of one (1) is assigned to IPO j listing in year i if the solicitor firm k used is one of two solicitor firms with the highest Rep_k ratios in year i. All other IPOs are scored zero (0).

Researchers (Koh and Walter, 1989; Kim and Ritter, 1999; Su and Fleisher, 1998) suggest the level of *ex ante uncertainty* is likely to be less in highly leveraged IPOs. Debt, therefore, may act as a credible signal of the IPO's quality. With higher debt the threat of bankruptcy imposes harsher budget constraints on managers, limits management's control over cash flows, and raises the risk to a firm's undiversified stock ownership (Levis, 1990). Lower quality firms are less likely to be willing to assume the additional concerns associated with high debt as they have a higher chance of being forced into bankruptcy. To control for signalling effects of leverage (Lev_j) we use the book value of total debt divided by the book value of the total assets of firm j as reported in the last financial period preceding the IPO.

We also control for bonus or stock option plans in executive compensation packages as their presence suggests a higher degree of information asymmetry. This presumption is based on the premiss that bonus or stock option plans are contingent on future net income and share price performance. This is likely to influence the incumbent management's time horizon. On average, IPO managers with bonus and stock options as part of their executive compensation packages have greater access to private information about future earnings than other stakeholders. IPO managers can use their inside information to optimise any bonus or stock option provisions to benefit their own self-interests rather than the interests of future shareholders. If outside stakeholders have the same information as IPO managers this may influence valuations of the IPO. For the control variable $ExeCP_j$ IPOs with a bonus or stock option plan as part of executive compensation packages is scored one (1), otherwise zero (0).

Finally, we include two controls for *ex ante uncertainty*: (1) offering size ($LnGP_j$) is measured as the natural logarithm of gross proceeds of the IPO as per the prospectus; and (2) prior operating history of the IPO (Age_j) is the natural logarithm of the number of days from the date of the firm's incorporation to the IPO date. Beatty and Ritter (1986) find when using the inverse of the gross proceeds from the offering (or one plus the number of uses of the proceeds) as a measure of *ex ante uncertainty*, smaller offerings are more 'speculative'. Prior research (e.g. Beatty, 1989; Clarkson, 1994; Clarkson and Merkley, 1994) also shows a negative and significant association between firm age and underpricing.

Proxy measures for all variables are defined and summarised in Table 1.

4.4. Main model specification and statistical tests

This study uses various statistical tests (univariate and tests of correlation) to analyse the data. The hypotheses are tested formally through multiple regression analysis. To formally test the three hypotheses developed for this study three specific regression models are estimated as follows:

$$ICDisc_j = \lambda_j + \beta_1 EDOR_j + \gamma_1 Aud_j + \gamma_2 Und\text{j} + \gamma_3 Sol_j + \gamma_4 Lev_j + \gamma_5 ExeCP_j + \gamma_6 LnGP_j + \gamma_7 Agej + \eta_j \quad (1)$$

$$ICDisc_j = \lambda_j + \beta_1 EDOR_j + \beta_2 HerfIndCon_j + \beta_3 EDOR_j * HerfIndCon_j + \gamma_1 Aud_j + \gamma_2 Und_j + \gamma_3 Sol_j + \gamma_4 Lev_j + \gamma_5 ExeCP_j + \gamma_6 LnGP_j + \gamma_7 Age_j + \eta_j \quad (2)$$

Table 1
Summary variables and their proxy measure determination

Variable title	*Variable description*
$ICDisc_j$	Ratio of the number of intellectual capital items *i* disclosed by IPO firm *j* in their prospectus to the number of intellectual capital items *i* applicable to firm *j* expressed as a percentage.
$EDOR_j$	α_j is calculated as $\alpha = (N - N_p - N_s)/N$ where N = number of common outstanding shares after the IPO of firm *j*, N_p = number of primary common outstanding shares offered via the IPO of firm *j* and N_s = number of secondary common outstanding shares offered via the IPO of firm *j* (note that α_j is expressed as a ratio in isolation). For the regression analysis (and application of the interaction terms) a transformation based on the natural logarithm α_j is then performed based on the following equation: $\alpha_j + \ln(1 - \alpha_j)$. This approach is consistent with prior literature (e.g. Downes and Heinkel, 1982; Clarkson et al., 1992; Jog and McConomy, 2003). $EDOR_j$ is used to denote the outcome of the transformation.
$HerfIndCon_j$	$$HerfIndCon = \sum_{j=1}^{N}\left[MarketShare_j\right]^2 = \sum_{j=1}^{N}\left[\frac{Sales_j}{\sum_{kl}^{N} Sales_{kl}}\right]^2$$ **Where:** *HerfIndCon* = measure of the industry concentration of the $industry_l$ to which $firm_j$ is entering; $MarketShare_j$ = Market share of $firm_j$ within $industry_l$ to which it is entering; $Sales_j$ = Sales of $firm_j$ for year immediately prior to its IPO as reported in the IPO prospectus; $Sales_{kl}$ = Sales as reported in the annual report of $firm_k$ in $industry_l$ for year immediately prior to the IPO of $firm_j$ entering $industry_l$; and N = number of firms in $industry_l$.
$CGScore_j$	$Firm_j$ is given a score of one (1) (otherwise zero (0)) for each of the following conditions in the corporate governance structure met at the time of the IPO: (a) number of independent directors on the board of directors at time of IPO exceeds the mandatory minimum; (b) the same individual does not occupy the roles of chairman of the board and chief executive officer; and (c) the chairman of the board of directors is a non-executive director independent of management. $Firm_j$ score can range from 0–3.
$EDOR_j$*$HerfIndCon_j$	Two-way interaction term. Definitions for $EDOR_j$ and $HerfIndCon_j$ are defined above.
$EDOR_j$*$CGScore_j$	Two-way interaction term. Definitions for $EDOR_j$ and $CGScore_j$ are defined above.
$HerfIndCon_j$*$CGScore_j$	Two-way interaction term. Definitions for $HerfIndCon_j$ and $CGScore_j$ are defined above.
$EDOR_j$*$HerfIndCon_j$*$CGScore_j$	Three-way interaction term. Definitions for $EDOR_j$, $HerfIndCon_j$ and $CGScore_j$ are defined above.
Aud_j	An indicator variable where IPO firm *j* is scored one (1) if it engages a Big Four audit firm as the auditor; otherwise scored zero (0).
Und_j	An indicator variable where IPO firm *j* is scored one (1) if it engages either of the top two underwriter firms (based on frequency) in the year of the firm's IPO; otherwise scored zero (0).
Sol_j	An indicator variable where IPO firm *j* is scored one (1) if it engages either of the top two solicitor firms (based on frequency) invited to the IPO in the year of the firm's IPO; otherwise scored zero (0).

Table 1
Summary variables and their proxy measure determination *(continued)*

Variable title	*Variable description*
Lev_j	Ratio of book value of total debt (expressed in Singapore Dollars (SGD)) for IPO firm *j* to total book value of total assets (expressed in (SGD)) of IPO firm *j* in the accounting period immediately preceding the IPO as per the prospectus.
$ExeCP_j$	An indicator variable where the IPO firm *j* is scored one (1) if the firm has a bonus or stock option component as part of its executive compensation plan; otherwise scored zero (0).
$LnGP_j$	Natural logarithm of the gross proceeds (based on the gross proceeds of the IPO as per the prospectus) to be received by firm *j* from the IPO (expressed in SGD).
Age_i	Natural logarithm of the number of days from the date of incorporation of firm *j* to the date of the IPO.

$$ICDisc_j = \lambda_j + \beta_1 EDOR_j + \beta_2 HerfIndCon_j + \beta_3 EDOR_j{*}HerfIndCon_j + \beta_4 CGScore_j + \beta_5 EDOR_j{*}CGScore_j + \beta_6 HerfIndCon_j{*}CGScore_j + {}_7\beta_7 EDOR_j{*}HerfIndCon_j{*}CGScore_j + \gamma_1 Aud_j + \gamma_2 Und_j + \gamma_3 Sol_j + \gamma_4 Lev_j + \gamma_5 ExeCP_j + \gamma_6 LnGP_j + \gamma_7 Age_j + \eta_j \quad (3)$$

Where:

Formal definitions are presented in Table 1;

λ_j = the coefficient on the intercept term;

β_i = the coefficients 1–7 on the independent and interaction variables;

γ_i = the coefficients 1–7 on the independent and interaction variables; and

η_j = the error term.

Support for H1 acceptance is derived if the coefficient β_1 on the independent variable $EDOR_j$ is found to be statistically significant at conventional levels and with a positive directional sign in regressions based on Equations 1, 2 and 3. In the context of H2, this hypothesis will be supported if the coefficient β_3 on the interaction variable $EDOR_j{*}HerfIndCon_j$ is statistically significant at conventional levels and the directional sign is negative in regressions based on Equations 2 and 3. Finally, there will be support to accept H3 if the coefficient β_7 on the interaction variable $EDOR_j{*}HerfIndCon_j{*}CGScore_j$ is statistically significant at conventional levels with a positive directional sign in regressions based on *Equations 3*.

5. Sample and results

5.1. Sample selection and industry distribution

Our initial sample comprises SGX IPOs satisfying the following criteria:

I. The IPO applied for initial listing on the SGX between 1 January 1997 and 31 December 2006 (based on listings from the SGX).

II. The IPO issued equity shares not previously publicly traded, and whose fiscal year end was prior to or on 31 December 2006.

III. The IPO is not a life investment fund, stock index fund, real estate unit fund or limited partnership.

IV. The IPO did not issue preferred shares only.

V. The IPO did not provide a prospectus as part of a cross-listing arrangement.

Of the 516 firms applying for a SGX listing between 1997 and 2006, 444 meet our prescribed criteria. Of those not meeting the criteria 27 were seasoned offerings, 27 unit fund related issues and five issuing only preferred shares. Another 13 IPOs are excluded: (i) due to insufficient prospectus information to construct the proxy measures; or (ii) incomplete prospectuses to enable measurement of intellectual capital disclosures. Our final useable sample comprises 86.05% of total IPOs during the review period. A breakdown of the sample selection by year is reported in Table 2, Panel A. The annual breakdown indicates IPO activity is particularly high during two sub-periods: (1) 1999–2000; and (2) 2004–2006. Strong IPO activity during 1999–2000 is synonymous with the hype surrounding the 'Internet Bubble' as found in

Table 2
Breakdown of sample selection process

Panel A: Sample selection

	Listing	*Reason for exclusion from sample*				*Included in sample*	
Year	*N*	*Seasoned offering*	*Fund types*$^{\Phi}$	*Preferred shares*	*Insufficient data*$^{\varphi}$	*N*	*% Total listing*
1997	15	2	1	0	1	11	73.33
1998	23	2	0	0	1	20	86.96
1999	51	3	2	0	2	44	86.27
2000	82	7	5	3	4	63	76.83
2001	37	3	1	0	0	33	89.19
2002	33	2	3	0	1	27	81.82
2003	60	4	2	1	2	51	85.00
2004	80	2	0	1	0	77	96.25
2005	69	1	4	0	1	63	91.30
2006	66	1	9	0	1	55	83.33
Total	**516**	**27**	**27**	**5**	**13**	**444**	**86.05**

Panel B: Industry composition of sample

Code	*SIC industry class description*	*N*	*% Sample*
A	Agriculture, Forestry and Fishing	7	1.58
B	Mining	3	0.68
C	Construction	24	5.41
D	Manufacturing	214	48.20
E	Transportation, Communications, Electric, Gas and Sanitary Services	41	9.23
F	Wholesale Trade	30	6.75
G	Retail Trade	15	3.38
H	Finance, Insurance and Real Estate	9	2.03
I	Services	97	21.84
J	Public Administration	4	0.90
	Total	**444**	**100.00**

Where:
Φ – Offerings categorised in this group included life investment funds, stock index funds and real estate funds that issued unit trusts via the SGX.
φ – IPOs classified as 'Insufficient Data' typically included those where a verifiable copy of the original prospectus could not be obtained, or IPOs where a prospectus was obtained but necessary information relevant to this study (such as for determining key variables) was not available.

other major capital markets (Ljungqvist and Wilhelm, 2002; Loughran and Ritter, 2002; Ofek and Richardson, 2003). High IPO activity in Singapore from 2004 through 2006 can be attributed, in part, to a growing enthusiasm for: (a) attracting China-based firms; or (b) investment into Singapore incorporated firms that are developing and/or expanding operations in China. Low IPO activity in 1997–1998 and 2001–2003 is likely due to poor economic conditions.[12]

An industry breakdown (US SIC single-digit classification) shown in Table 2, Panel B shows nearly 50% of the IPOs representation were from the manufacturing sector (i.e. 214 of 444 or 48.20%). The strong representation of IPOs from the manufacturing sector is consistent with underlying dominance of this industry sector in Singapore. The services sector is also strongly represented with 21.84% (i.e. 97 of 444) of the IPOs being classified into this business sector. Given Singapore's lack of natural resources it is not surprising few mining firms listed on the SGX (i.e. 3 or 0.68%). Mining sector firms listing on the SGX generally had extensive mining operations in Indonesia, Malaysia or Vietnam.

[12] In late 1997, for example, Singapore (like other Asian nations) was savaged by the Asian Financial Crisis that lingered into 1998. Whilst in the midst of an economic recession in 2001–2002 Singapore's economic prosperity was further dampened by the SARS crisis.

5.2. Descriptive results

Table 3, Panel A reports an annual breakdown of the raw amount of intellectual capital disclosure. Average raw total intellectual capital disclosure rises yearly from 15.091 items in 1997 to a peak of 28.863 items in 2003 followed by a decline in 2004 (24.429 items) and 2005 (22.175 items) before a rebound in 2006 (26.145 items). An ANOVA test (not tabulated) did not indicate significant variations in the annual average total raw intellectual capital disclosure across the study period. Bukh et al. (2005a) is presently the only study enabling any meaningful longitudinal comparison.[13] They (Bukh et al., 2005a) report an annual upward trend in IC disclosure in Danish IPO prospectuses from 1990 to 1999 with a slight decline in 2000 and 2001.[14] Comparatively, average raw intellectual capital disclosure for Singapore IPOs is marginally below Danish IPOs from 1997 to 2001 (the period during which both studies overlap).[15]

An annual raw disclosure breakdown by major intellectual capital categories is also reported in Table 3, Panel A.[16] Changes in raw disclosure associated with human resource, customer and process capital follows a similar path (i.e. upward annually from 1997–2003 with a decline in 2004 and 2005, and then rising in 2006) to total raw intellectual capital disclosure. Average raw disclosure on information technology capital spiked in 1999 (1.159 items) followed by an annual decline. Disclosure related to information technology capital again spikes in 2003 (0.882) before two further years of moderation before a third spike in 2006 (0.891 items). This pattern of spikes followed by declines could be systematic of fluctuations in expenditure and attention to information technology that could follow cyclical paths. Average raw R&D capital disclosures fluctuated between 1997 and 2002 before a rise and stabilisation in 2003 and 2004. There is a dip in 2005 with a rebound in the subsequent year. Besides two anomalies in 1997 and 2003 the average raw disclosure for strategic capital is quite flat though with a sharp rise in 2006 relative to prior years.

An annualised breakdown of average $ICDisc_j$ scores is reported in Table 3, Panel B. Consistent with average raw total disclosures the average $ICDisc_j$ scores increased annually from 1997 to 2003 (18.631% to 35.633%) before a pullback in 2004 (30.159%) and 2005 (27.376%). This is followed by an increase in 2006 (32.278%). An ANOVA test (not tabulated) did not indicate significant variations at conventional levels between the annual average $ICDisc_j$ scores.

Descriptive statistics for the independent variables (based on pooled sample) are reported in Table 3, Panel C.[17] Statistical tests (not tabulated) show only the mean annual values for $EDOR_j$ and Age_i differ significantly. Of 2001 IPOs (and to some degree 2002 IPOs) average retained ownership and age is significantly higher than 2004–2005 IPOs. Poor economic conditions in Singapore in 2001 may partially explain this observation. With the economy struggling, only high quality firms (indicated by a higher level of retained ownership and/or a longer established record) would have found it viable to list. A more buoyant economy in 2004–2006 would have provided a higher likelihood of reasonable returns. Thus, a higher number of lower-quality firms and/or those with a shorter prior operating history would have been attracted to list in 2004–2006 as opposed to 2001. The average $HerfIndCon_j$ score (0.192) indicates business sectors being entered by IPOs between 1997 and 2006 were moderately to highly concentrated. This result is consistent with prior views that business sectors in Singapore are dominated by large sector leaders that capture the majority of sales turnover. The average corporate governance score for the pooled sample (i.e. 2.321) implies that upon listing on the SGX IPOs were, in general, well governed. However, descriptive statistics for $CGScore_j$ also indicate variations in standards.

[13] Bukh et al., (2005b) measure IC disclosures of a sample of Japanese firms using the Bukh et al., (2005a) index but only for a single year (i.e. 2003). Strom (2005) also measures intellectual capital disclosures in prospectuses of Swedish IPOs. His index (Strom, 2005) comprises fewer items and focuses on specific subsets of intellectual capital from Bukh et al., (2005a).

[14] The upward trend is consistent with growth in the awareness and attention to intellectual capital issue during the 1990s.

[15] Data for the Bukh et al. (2005a) study is from 1990 to 2001. Whilst not a specific parallel to our study the Bukh et al. (2005a) study provides a basic benchmark.

[16] As the number of items in each major category varies a comparison of raw disclosure between categories is not prudent. Caution should be taken if making any such comparison. Due to difficulty in making such a comparison we do not provide any commentary in this paper on any cross-category comparisons.

[17] IPOs opting to disclose less intellectual capital information in their prospectus may have different organisational characteristics than IPOs disclosing more (Bukh et al., 2005a). For instance, a smaller IPO may opt not to disclose as much intellectual capital information due to the threat of competitive pressures from larger firms. Larger IPOs, however, may not be subject to this disincentive. Table 3, Panel A describes various organisational characteristics for the pooled sample. Using the median value (for the pooled sample and by year) for each organisational characteristic as the cut-off point we conducted statistical tests to determine if the level of intellectual capital disclosure may have been significantly influenced by relevant firm-specific characteristics. Any significant variations noted may have inferred possible self-selection bias. Between and within tests (not tabulated for brevity) did not indicate any significant differences in the level of intellectual capital disclosure (for the pooled sample or individual years) due to the firm-specific characteristics listed in Table 3, Panel A. Based on these findings we conclude that self-selection bias is not a significant concern with the sample.

Table 3
Descriptive statistics

Panel A: Annualised breakdown of raw IC disclosure by major category

Year	*Total*	*HRM*	*CC*	*ITC*	*PC*	*RandDC*	*SC*
1997 (n = 11)	15.091	6.636	1.636	0.818	1.818	0.545	3.636
1998 (n = 20)	16.000	5.100	1.800	0.050	2.000	1.750	5.300
1999 (n = 44)	19.205	6.909	1.977	1.159	2.364	1.841	4.955
2000 (n = 63)	20.714	7.730	2.222	0.635	2.397	2.286	5.444
2001 (n = 33)	20.576	8.394	1.848	0.394	2.606	1.727	5.606
2002 (n = 27)	23.000	9.074	3.148	0.111	2.889	2.185	5.593
2003 (n = 51)	28.863	10.098	4.686	0.882	3.353	2.745	7.098
2004 (n = 77)	24.429	9.416	2.403	0.494	3.312	2.883	5.922
2005 (n = 63)	22.175	8.413	1.952	0.540	2.921	2.587	5.762
2006 (n = 55)	26.145	9.218	3.527	0.891	3.364	3.200	5.945
Total (n = 444)	22.802	8.480	2.631	0.637	2.869	2.439	5.745

Panel B: Annualised breakdown of $ICDisc_j$

Year	*Mean %*	*Standard deviation*	*25th percentile*	*Median*	*75th percentile*
1997 (n = 11)	18.631	3.763	16.049	19.753	20.988
1998 (n = 20)	19.753	5.650	14.815	18.519	23.148
1999 (n = 44)	23.709	6.592	20.370	23.457	27.160
2000 (n = 63)	25.573	5.978	20.988	24.691	29.630
2001 (n = 33)	25.402	5.711	20.988	24.691	28.395
2002 (n = 27)	28.395	4.926	25.926	27.160	33.333
2003 (n = 51)	35.633	7.230	31.173	35.802	40.741
2004 (n = 77)	30.159	7.025	24.691	29.630	35.494
2005 (n = 63)	27.376	6.835	22.395	27.115	31.752
2006 (n = 55)	32.278	6.911	26.498	31.992	41.643
Total (n = 444)	28.150	7.336	20.117	27.994	33.943

Panel C: Control variable descriptive statistics (N = 444)

Control variable$^{\Phi}$	*Mean*	*Standard deviation*	*25th percentile*	*Median*	*75th percentile*
α_j	0.791	0.065	0.733	0.760	0.822
$EDOR_j$	–0.744	0.212	–0.833	–0.642	–0.621
$HerfIndCon_j$	0.192	0.091	0.141	0.188	0.211
$CGScore_j$	2.321	0.381	1.652	2.247	2.402
Aud_j	79.962				
Und_j	69.951				
Sol_j	41.381				
Lev_j	0.592	0.292	0.408	0.562	0.712
$ExeCP_j$	47.224				
Gross proceeds	$40,150,708	$47,491,448	$4,600,130	$10,350,000	$68,221,000
$LnGP_j$	16.606	0.988	15.242	16.587	17.006
Age in days	2,100	4,091	250	881	4,572
Age_i	6.749	1.527	5.544	6.507	8.181

Where:
See Table 1 for definitions of variables.
‡ – Of all the dependent, independent and control variables ANOVA tests indicate only significant variations in mean values between each year of the review period for $EDOR_j$ and Age_i.
Φ – The control variables are all shown in italics. Variables not in italics are supplementary information related to respective control variables before transformation. For all control variables measured using a dichotomous scale (i.e. Aud_j, Und_j, Sol_j and $ExeCP_j$) the value reported is the percentage of the sample that employed the services of a Big Four audit firm, prestige underwriter and/or highly reputable solicitor firm, and those with bonuses and stock options as a component of the executives compensation package. For example, 79.962% of the sample (or 355 IPOs of 444) engaged a Big Four audit firm.

5.3. Correlation matrix

Table 4 presents a correlation matrix with the upper half reporting Pearson pairwise correlation coefficients (cr_p), the lower half Spearman correlation coefficients (cr_s). $ICDisc_j$ is positively significantly correlated with $EDOR_j$ ($p<0.01$, cr_p and cr_s). The directional sign on both Pearson and Spearman correlations is consistent with our expectations and other related work (e.g. Jog and McConomy, 2003; Guo et al., 2004). $ICDisc_j$ is also positively significantly correlated with $CGScore_j$ ($p<0.05$, cr_p and cr_s). Again, these results are consistent with our expectations.

$ICDisc_j$ is also positively significantly correlated with: (a) Und_j ($p<0.01$, cr_p and cr_s); (b) Lev_j ($p<0.01$, cr_p and cr_s); and (c) Age_j ($p<0.05$, cr_p and cr_s). Meanwhile, the dependent variable is negatively significantly correlated with Sol_j ($p<0.01$, cr_p and cr_s) and $LnGP_j$ ($p<0.01$, cr_p and cr_s). Directional signs on all significant correlations between dependent and control variables are as expected (e.g. Firth and Liau-Tan, 1998; Jog and McConomy, 2003). There are no meaningful correlations between the independent variables that imply any significant issues in interpreting multiple regression results. Finally, significant correlations between control variables are noted. The maximum Pearson (Spearman) correlation being between Lev_j and $LnGP_j$ ($p<0.01$, cr_p and cr_s) is 0.425 (0.451) is below critical levels (i.e. 0.8, see Hair et al., 1995; Greene, 1999) for multicollinearity to be a serious concern in OLS regression analysis. Variance inflation factor (VIF) scores also calculated (not tabulated) further indicated no serious problems with multicollinearity.[18]

5.4. Regression findings

A series of OLS regressions are reported in Table 5. Base model results are reported in Panel 1 whilst regressions testing H1, H2 and H3 respectively are shown in Panels 2, 3 and 4. Coefficients on $EDOR_j$ are positive and significant ($p<0.05$, two-tailed significance) in the regressions reported in Panels 2, 3 and 4. This result is consistent with our expectations and supports the acceptance of H1. The coefficients on $HerfIndCon_j$ are negative and significant ($p<0.10$, two-tailed significance) in Panels 3 and 4 implying that IPOs entering more concentrated business sectors reported less intellectual capital information in their listing prospectuses. The result of importance with respect to H2, however, is the coefficients on the interaction term $EDOR_j$*$HerfIndCon_j$ where in Panels 3 and 4 they are both negative and significant ($p<0.05$, two-tailed significance). Results related to this interaction term are consistent with the expectations of H2. The coefficient on $CGScore_j$ is positive and moderately significant ($p<0.10$, two-tailed significance) in Panel 4 results. This result is consistent with the expectation that better governance is likely to prompt greater transparency. For our study the term of importance in Panel 4 is the coefficient on the three-way interaction term. The result of importance in respect to H3, however, is the coefficients on the interaction term $EDOR_j$*$HerfIndCon_j$*$CGScore_j$. Findings show that whilst the directional sign on $EDOR_j$*$HerfIndCon_j$*$CGScore_j$ is as expected the coefficient is insignificant. This result, therefore, does not support the acceptance of H3.

With respect to the control variables coefficients on Und_j are positive and significant ($p<0.01$ Table 5, Panels 1–4, two-tailed significance). The positive and significant result suggests that IPOs engaging a higher quality underwriter were likely to disclose more information than counterparts using the services of a lower quality underwriter. The additional disclosure could be the result of pressure on the IPO from the high quality underwriter seeking to preserve their reputation capital. Conversely, coefficients on Sol_j are all negative and significant ($p<0.05$, Table 5, Panels 1 and 2; $p<0.10$, Table 5, Panels 3 and 4; two-tailed significance). Results for Sol_j appear contrary to a 'reputation capital' proposition for additional disclosure. Rather, the negative and significant results may imply IPOs engaging a high quality legal firm may have been advised to limit excess disclosure so as to avoid possible future litigation as over ambitious conclusions are drawn by investors from greater disclosure. Consistent with expectations, the coefficients on Lev_j ($p<0.05$, Table 5, Panels 1–4; two-tailed significance) and Age_j ($p<0.05$, Table 5, Panel 1–3; $p<0.10$, Panel 4; two-tailed significance) are positive and statistically significant. Coefficient on $LnGP_j$, meanwhile, is negative and statistically significant implying that IPOs seeking to raise greater funds were less forthcoming in disclosing information on intellectual capital at the time of listing than those raising less funds. Finally, Aud_j ($ExeCP_j$) coefficients are positive (negative) but insignificant in all models.

5.5. Robustness tests

To check the robustness of our main findings we conducted several additional tests. For example, prior disclosure research frequently cites firm size and industry as having a significant influence on disclosure practices. Consequently, we partitioned the sample into: (a) small and large firm sub-samples based on proceeds raised; and (b) manufactur-

[18] The highest calculated VIF is 3.81. As VIFs in excess of 10 are deemed to be evidence of serious multicollinearity (Netter et al., 1989: 40) standard interpretations of the regression coefficients presented in the tables can be made. Other diagnostics (eigenvalues and condition values) further suggest that multicollinearity is not a significant problem.

Table 4
Correlation (Pearson and Spearman) Matrix

Variable	$ICDisc_j$	$HerfIndCon_j$	$CGScore_j$	$EDOR_j$	Aud_j	Und_j	Sol_j	Lev_j	$ExeCP_j$	$LnGP_j$	Age_j
$ICDisc_j$		–0.231*	0.117**	0.154*	0.012	0.134*	–0.235*	0.125**	0.026	–0.115**	0.107**
$HerfIndCon_j$	–0.218*		–0.084	–0.021	0.161*	–0.008	–0.026	–0.032	–0.042	–0.161*	–0.149*
$CGScore_j$	0.092**	–0.015		–0.109**	–0.049	–0.128**	–0.056	–0.182*	0.125**	0.036	0.087
$EDOR_j$	0.164*	–0.091	–0.068		–0.001	–0.049	0.054	0.270*	0.384*	0.306*	–0.020
Aud_j	0.015	0.182*	–0.066	0.019		0.046	0.167*	0.218*	0.107**	0.239*	0.074
Und_j	0.156*	–0.011	–0.133*	–0.089	0.032		–0.029	0.013	–0.052	–0.001	0.152*
Sol_j	–0.222*	–0.012	–0.049	0.076	0.167*	–0.029		0.133*	0.052	0.205*	–0.081
Lev_j	0.141*	–0.059	–0.121**	0.335*	0.218*	0.013	0.133*		0.179*	0.425*	0.063
$ExeCP_j$	0.043	–0.083	0.158*	0.399*	0.107**	–0.052	0.052	0.179*		0.221*	–0.035
$LnGP_j$	–0.146*	–0.101**	0.038	0.338*	0.250*	–0.017	0.224*	0.451*	0.257*		–0.053
Age_j	0.102**	–0.076	0.119**	–0.048	0.082	0.149*	–0.082	0.056	–0.027	–0.064	

Where:
See Table 1 for definitions of variables.
* and ** – Significant at 0.01 and 0.05 or better respectively (two-tailed significance).

Table 5
Multivariate tests

Variable	Panel 1: *Base model*	Panel 2: *Test of H1*	Panel 3: *Test of H2*	Panel 4: *Test of H3*
Intercept	0.061 (0.78)	0.077 (0.83)	0.245 (1.27)	0.231 (1.14)
Control variables				
Aud_j	0.005 (–0.09)	–0.017 (–0.17)	–0.030 (–0.51)	–0.026 (–0.44)
Und_j	0.125 (2.97)*	0.122 (2.92)*	0.123 (2.95)*	0.118 (2.82)*
Sol_j	–0.086 (–2.04)**	–0.084 (–2.01)**	–0.074 (–1.77)‡	–0.071 (–1.67)‡
Lev_j	0.123 (2.53)**	0.117 (2.39)**	0.122 (2.47)**	0.018 (2.38)**
$ExeCP_j$	–0.048 (–0.50)	–0.046 (–0.42)	–0.079 (–0.74)	–0.077 (–0.73)
$LnGP_j$	–0.067 (–2.03)**	–0.062 (–2.01)**	–0.055 (–1.88)‡	–0.040 (–1.79)‡
Age_j	0.130 (2.24)**	0.138 (2.32)**	0.124 (2.03)**	0.112 (1.92)‡
Test variables				
$EDOR_j$		0.106 (2.39)*	0.100 (2.26)**	0.099 (2.24)**
$HerfIndCon_j$			–0.091 (–1.89)‡	–0.089 (–1.75)‡
$EDOR_j*HerfIndCon_j$			–0.123 (–2.23)**	–0.116 (–1.99)**
$CGScore_j$				0.120 (1.91)‡
$EDOR_j*CGScore_j$				0.084 (2.21)**
$HerfIndCon_j*CGScore_j$				0.029 (0.81)
$EDOR_j*HerfIndCon_j*CGScore_j$				0.169 (1.14)
Model summary:				
F-Statistic	7.53*	8.50*	8.64*	8.82*
Adjusted R^2	0.2390	0.2751	0.2905	0.2914
N	444	444	444	444

Where:
See Table 1 for definitions of variables.
The regression results reported in Panel 1 are based on Equation 1 excluding all test variables whilst results reported in Panel 2 are based on the complete *Equation 1*. Panel 3 results, meanwhile, are based on *Equation 2*. Finally, the regression results reported in Panel 4 are based on *Equation 3*.
*, ** and ‡ – Significant at 0.01, 0.05 and 0.10 or better respectively (two-tailed significance with t-statistic based on White's heteroscedasticity-consistent covariance matrix).

ing and non-manufacturing industry sub-samples. Regression analysis performed again on the respective sub-samples did not yield any significantly different results then that reported in Table 5. That is, results hold for both small and large firms and those from both manufacturing and non-manufacturing industries. A review of the various disclosure and IPO studies indicates a number of factors investigated could have been included as possible control variables. Whilst we have sought to have been as comprehensive as possible in our research method development, it is difficult to ignore the possibility that omitted variables may influence our reported results. As a consequence we conducted additional analysis involving the inclusion of other previously identified factors as controls for cross-sectional variations. Factors used in these additional tests included operating performance (pre- and post-IPO), firm's earnings growth and venture capitalist involvement. Again, additional tests using extra control variables did not yield different findings reported in Table 5. Finally, we varied the measurement of some of the independent and control variables. For instance, in the case of $CGScore_j$, rather than have a range from zero to three, we used a dichotomous scale whereby a firm is scored one if at least two of the three conditions are met otherwise zero. All tests using alternative proxy measures for select independent and control variables do not result in any significant differences from Table 5 results.

6. Concluding remarks

Since its initial evolution, scholarly research into intellectual capital has followed several streams of enquiry. Aside from considerable attention given to defining and modelling of intellectual capital, or the measurement of intellectual capital and its respective components, growing attention has focused on the reporting of intellectual capital-related information. Schrand and Verrecchia (2004) report disclosure research can be categorised into

three main streams: (1) nature and type of information reported; (2) determinants underlying disclosure; and (3) consequences of accounting information disclosures. At present, studies examining intellectual capital reporting concentrated on issues related to Schrand and Verrechia's (2004) first stream. Of the few intellectual capital disclosure studies examining the determinants of disclosure, the vast majority rely on traditional factors (e.g. firm size, economic performance, industry) whilst examining conventional modes of investor communication (i.e. the annual report). Our study differs in two important ways. First, we look to examine the amount and nature of intellectual capital disclosure within an IPO setting. Second, we seek to determine the association between intellectual capital disclosure and ownership retention at the time of listing, plus the interaction effects of proprietary costs and corporate governance structure.

Our analysis of 444 IPOs listing on the SGX between 1 January 1997 and 31 December 2006 indicates the amount of intellectual capital information disclosed in prospectuses on average grew annually from 1997 to 2003. This was followed by two years of decline before a rebound in 2006. Disclosure associated with human resource capital, customer capital and process capital themes followed similar paths to that of the overall level of intellectual capital disclosure. In contrast, the pattern of average disclosure related to information technology capital, research and development capital and strategic capital themes varied more radically from year-to-year.

Consistent with our predictions, we find a positive association between the extent of intellectual capital disclosure and ownership retention. Specifically, our results imply that when *pre*-IPO owners retained a higher level of ownership in the entity *post*-IPO there is a greater willingness to provide investors with greater insights into the IPO's intellectual capital resource base and potential. The positive intellectual capital disclosure – ownership retention linkage may be indicative of a broader complementary firm quality – transparency relationship. Various IPO researchers argue greater ownership is a reflection of an IPO's quality. Conscious of the signalling effect of ownership retention, *pre*-IPO owners may wish to supplement this perception when providing greater transparency to reinforce confidence amongst investors in the IPO's quality. Given the costly nature of signals, our results suggest that as intellectual capital is still in its infancy and not fully understood by market participants (Johanson, 2003), IPO issuers are willing to retain a higher level of ownership as a complementary signal to reinforce the quality and value relevance of the intellectual capital information disclosed.

Additional analysis in consideration of the possible inhibiting effects of proprietary costs (as predicted by H2) on the positive intellectual capital disclosure – ownership retention association indicates a negative significant interaction influence. This result implies that whilst an IPO with greater ownership retention *post*-IPO is likely to have disclosed more intellectual capital-related information in the prospectus, the extent of disclosure would have been tempered for those firms entering a business sector with greater proprietary costs. That is, due to the threat of competition in highly concentrated industries an IPO entering these business sectors appears reluctant to disclose intellectual capital information in greater quantity for fear of losing a competitive advantage.

Given the mounting interest related to the impact of corporate governance on business operations including that related to disclosure we extended our analysis in examining if better corporate governance structures upon listing influenced the ownership retention – proprietary cost interaction on intellectual capital disclosure levels. Analytical tests did not support our predictions of a significant positive influence on the aforementioned interaction.

Our findings have implications for various parties. For instance, issuers could be at a greater disadvantage if intellectual capital disclosures are not used for any strategic objective. If the disclosure of more intellectual capital does not assist to reduce underpricing or improve long-term post-issue stock performance but provides key information to competitors – thereby reducing the IPO's competitive advantage – then the issuers will be exposed to additional costs of capital. However, if the disclosure of intellectual capital information can be used strategically to effectively reduce information asymmetry and improve investor and analyst valuations then the differential between the issue and first-day offer price can be narrowed. As the amount of 'money left on the table' decreases, the cost of capital is reduced.[19] Our findings may also have implications for policymakers if greater intellectual capital disclosure is creating a speculative IPO environment. If investors are bidding up the price they are willing to pay for an IPO based on intellectual capital disclosures, without knowing all the related risks (such as that associated with the intangible nature of intellectual capital), an unhealthy speculative environment could evolve. This is particularly true if issuers are seeking to exploit this position. Policymakers with the ability to prescribe reporting standards could introduce a

[19] The phrase 'money left on the table' is commonly used in IPO literature. This phrase refers to underpricing where 'money left on the table' is the capital lost when the company raises a level of funds at a given issue price when it could have raised the same amount of capital if stock had been offered at a higher price.

basic set of practices to enhance consistency and comparability in the disclosure of intellectual capital information.

Whilst our study contributes to an understanding of the consequences of intellectual capital disclosures, it is not without some caveats. For example, our analysis only allows us to identify an association and not a causal relationship. Future research may seek to develop a research method to determine precisely how issuers are using intellectual capital disclosures in the IPO process. This may involve a: (i) closer examination of the precise nature of the intellectual capital disclosure (i.e. good versus bad, qualitative versus quantitative, etc); (ii) precise placement of the intellectual capital disclosure in the prospectus; or (iii) intellectual capital disclosure in the prospectus relative to related disclosures via other mechanisms (i.e. media reports, financial analysts reports, etc.). Also, this study only uses IPO data from a single capital market. This may make general extrapolation to other domestic settings problematic because institutional structures in Singapore that are contributing to the positive intellectual capital disclosure–ownership retention may differ significantly in other jurisdictions. Furthermore, the interaction influence of proprietary costs could vary in nations where business sector concentrations differ. Research using data from other domestic settings is warranted to determine the precise nature of the intellectual capital disclosures and determinants examined in our study.

Despite some noted caveats, our study is one of the first to provide valuable insights into the determinants of intellectual capital disclosure beyond traditional factors and also in an alternative setting (i.e. IPO). This contribution is important given the growing significance of intellectual capital to a firm's sustainable competitive advantage. Also, it opens a new avenue for intellectual capital research. Our findings imply a possible need to rethink the general reasons and incentives underlying why IPOs in the 'new economic' era may or may not be disclosing new emerging types of financial and non-financial information such as that related to intellectual capital.

Appendix A
Intellectual Capital Disclosure Index

Item Category and Item Description
Human Resources (28 items)
Employee breakdown by age
Employee breakdown by seniority
Employee breakdown by gender
Employee breakdown by nationality
Employee breakdown by department
Employee breakdown by job function
Employee breakdown by level of education
Rate of employee turnover
Comments on changes in the number of employees
Comment on employee health and safety
Employee absenteeism rate
Comments on employee absentee rate
Discussion of employee interviews
Statements of policy on competency development
Description of competency development programmes and activities
Education and training expenses
Education and training expenses by number of employees
Employee expenses by number of employees
Recruitment policies of the firm
Separate indication firm has a HRM department, division or function
Job rotation opportunities
Career opportunities
Remuneration and incentive systems
Pensions
Insurance policies
Statements of dependence on key personnel
Revenues to employee
Value added to employee

Appendix A
Intellectual Capital Disclosure Index *(continued)*

Item Category and Item Description
Customers (14 items)
Number of customers
Sales breakdown by customer
Annual sales per segment or product
Average purchase size by customer
Dependence on key customers
Description of customer involvement in firm's operations
Description of customer relations
Education/training of customers
Ratio of customers to employees
Value added per customer or segment
Absolute market share (%) of the firm within its industry
Relative market share (not expressed as percentage) of the firm
Market share (%) breakdown by country/segment/product
Repurchases by customers
Information Technology (6 items)
Description of investments in information technology
Reason(s) for investments in information technology
Description of existing information technology systems
Software assets held or developed by the firm
Description of intellectual technology facilities (e.g. buildings)
Information technology expenses
Processes (9 items)
Information and communication within the company
Efforts related to the working environment
Working from home
Internal sharing of knowledge and information
External sharing of knowledge and information
Measure of internal processing failures
Measure of external processing failures
Discussion of fringe benefits and company social programs
Outline of environmental approvals and statements/policies
Research & Development (9 items)
Statements of policy, strategy and/or objectives of R&D activities
R&D expenses
Ratio of R&D expenses to sales
R&D invested into basic research
R&D invested into product design and development
Details of future prospects regarding R&D
Details of existing company patents
Number of patents and licenses etc.
Information on pending patents
Strategic statements (15 items)
Description of new production technology
Statements of corporate quality performance
Information about strategic alliances of the firm
Objectives and reason for strategic alliances
Comments on the effects of the strategic alliances
Description of the network of suppliers and distributors

Appendix A
Intellectual Capital Disclosure Index *(continued)*

Item Category and Item Description
Strategic statements (15 items) *(continued)*
Statements of image and brand
Corporate culture statements
Statements about best practices
Organisational structure of the firm
Utilisation of energy, raw materials and other input goods
Investment in the environment
Description of community involvement
Information on corporate social responsibility and objective
Description of employee contracts/contractual issues

Disclosure index adapted from Beaulieu et al. (2002), Bukh et al. (2005a) and Williams (2001)

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